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EXAMINER	
MUTSCHLER, BRIAN L	

ART UNIT	PAPER NUMBER
1753	11

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Please find below and/or attached an Office communication concerning this application or proceeding.

A8-11

Office Action Summary	Application No.	Applicant(s)	
	09/815,621	JENSON ET AL.	
	Examiner	Art Unit	
	Brian L. Mutschler	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 24 February 2003.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 40-58 and 78-141 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 40-58 and 78-141 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 24 February 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Comments

1. The objections to the drawings have been overcome by Applicant's amendment.

2. The objections to the specification have been overcome by Applicant's amendment.

3. The objections to claims 55, 99, 110, 122 and 134 have been overcome by Applicant's amendment.

4. The rejection of claims 106, 107, 111, 121 and 133 under 35 U.S.C. 112, second paragraph, has been overcome by Applicant's amendment.

5. The rejection of claims 40-45, 47-55, 58, 82, 83, 85-89, 109-116, 121-127 and 133-135 under 35 U.S.C. 102(b) as being anticipated by Tyan (U.S. Pat. No. 4,207,119) have been overcome by Applicant's amendment. While Tyan discloses the use of ion plating and other techniques that supply energy to the semiconductor material, Tyan does not explicitly disclose that the energy is "focused ion energy" as the independent claims now recite. The same also applies to claims 90-104, rejected under 35 U.S.C. 103 over Tyan. New rejections, necessitated by Applicant's amendment, have been set forth below.

6. The rejection of claims 40-46, 51, 53, 56, 78, 80-89, 95, 96, 101, 102, 104, 113-115 and 124-126 under 35 U.S.C. 102(e) as being anticipated by Walpita (U.S. Pat. No. 6,236,061) have been overcome by Applicant's amendment. While Walpita discloses the use of ion beam energy in the deposition of semiconductor layers, Walpita does not disclose the use of a secondary source, as the independent claims now recite. The

same also applies to claims 57, 79, 90-94, 97-100, 103, 105-108, 117-120 and 128-132. New rejections, necessitated by Applicant's amendment, have been set forth below.

Claim Objections

7. Claims 40, 113, 124 and 136-141 are objected to because of the following informalities:

a. In claim 40 at line 9, "focussed" should be changed to --focused--;

b. In claim 113 at line 9, "focussed" should be changed to --focused--;

c. In claim 124 at line 9, "focussed" should be changed to --focused--;

d. In claim 136 at lines 1 and 2, "focussed" should be changed to --focused--;

e. In claim 137 at line 1, "focussed" should be changed to --focused--;

f. In claim 138 at line 1, "focussed" should be changed to --focused--;

g. In claim 139 at line 1, "focussed" should be changed to --focused--;

h. In claim 140 at line 1, "focussed" should be changed to --focused--; and

i. In claim 141 at line 1, "focussed" should be changed to --focused--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-
(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

9. Claim 78 is rejected under 35 U.S.C. 102(b) as being anticipated by Tyan (U.S. Pat. No. 4,207,119).

Tyan discloses a method for making a photovoltaic (PV) cell comprising a transparent substrate **14** having a first electrode **16** formed thereon, a first semiconductor film **18** and a second semiconductor film **20** formed on the first electrode **16**, and a second electrode film **22** formed on the second semiconductor layer **20** (col. 6, lines 12-29; fig. 2).

Claim 78 is a product-by-process claim, wherein the patentability is determined by the product itself. Since Tyan teaches all of the structural limitations recited in the instant claim, the reference is deemed to be anticipatory.

10. Claim 78 is rejected under 35 U.S.C. 102(e) as being anticipated by Walpita (U.S. Pat. No. 6,236,061).

Walpita discloses a method for making a PV cell using ion-assisted e-beam evaporation (col. 6, lines 11-12). The PV cell **60** comprises a substrate **64** having an electrode film **64** formed thereon, a first semiconductor layer **68** and a second semiconductor layer **70**, and a second electrode film **76** formed on the second semiconductor layer **70** (col. 7, lines 32-55; fig. 4).

Claim 78 is a product-by-process claim, wherein the patentability is determined by the product itself. Since Walpita teaches the limitations recited in the instant claims, the reference is deemed to be anticipatory.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 40-45, 47-55, 58, 82, 83, 85-89, 109-116, 121-127 and 133-141 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tyan (U.S. Pat. No. 4,207,119) in view of Armini et al. (U.S. Pat. No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039).

Regarding claims 40, 109, 113, 121, 124 and 133, Tyan discloses a method for making a photovoltaic (PV) cell comprising a transparent substrate **14** having a first electrode **16** formed thereon, a first semiconductor film **18** and a second semiconductor film **20** formed on the first electrode **16**, and a second electrode film **22** formed on the second semiconductor layer **20** (col. 6, lines 12-29; fig. 2). Leads **24** are attached to the first and second electrodes **16, 22** (col. 6, lines 19-20; fig. 2). The semiconductor layers **18, 20** are formed by depositing a semiconductor material using a deposition source by supplying energy to the semiconductor material to deposit the material in layers (col. 3, lines 28-45). Specifically, Tyan discloses the use of "sputtering or ion plating wherein

ionized or plasma gas, respectively, is the activating medium" (col. 3, lines 35-40). These methods form the semiconductor layers by supplying energized particles through ionization or by forming a plasma, which is a charged state of matter wherein an equal number of positively charged and negatively charged ions exist simultaneously. Tyan also deposits dopant materials using a vapor phase deposition (col. 3, lines 60-68).

Regarding claims 41-45, 47-55, 58, 82, 83, 85-89, 110-112, 114-116, 122, 123, 125-127 and 134-141, Tyan discloses forming a PV cell comprising a first semiconductor layer **18** of n-type polycrystalline CdS and a second semiconductor layer **20** of p-type polycrystalline CdTe (col. 6, lines 12-29). The semiconductor layers are formed to a thickness of about 0.05 microns to about 5 microns, or about 50 nm to about 5000 nm (col. 6, lines 20-25). The semiconductor layers are deposited by a method of supplying energized particles using ion plating or sputtering, therefore supplying sulfur, cadmium and telluride ions to the layers as they are formed. Additionally, Tyan discloses forming the semiconductor layers in the presence of oxygen or argon gas, which have ionization energies of 12 eV and 15.75 eV, respectively (col. 7, line 65). The substrate is held at a temperature between about 300 degrees Celsius and 650 degrees Celsius (col. 4, lines 19-22).

The method of disclosed by Tyan differs from the instant invention because Tyan does not disclose the following:

a. Supplying focused ion energy from a secondary source to the semiconductor material, as recited in claims 40, 113 and 124;

b. Supplying energized ions focused at the film surface, as recited in claim 136;

c. Supplying energized xenon ions, as recited in claim 138; and

d. Controlling a quality o a physical interface between the second film and the third film, as recited in claim 141.

Regarding claims 40, 113, 124 and 136, Ovshinsky discloses a method for forming layers of materials, which may be deposited by sputtering or plasma deposition, wherein "one ore more ion beams can be combined with a plasma, sputtering or other type of deposition parameters to insert atoms into the material as it is being deposited" (col. 8, lines 16-30). Ovshinsky further states, "The techniques of the invention can be utilized as a new way of doping photovoltaic materials" (col. 11, line 53 to col. 12, line 2).

Armini et al. teach a method for making solar cells, wherein semiconductors making up the solar cells are doped using an ion implanting step (col. 4, lines 12-24). An ion beam implanter **24** uses an ion source **34** for generating an ion beam **36** which is focused by a lens **40** and directed onto the semiconductor material (col. 4, lines 25-41). This method of ion beam implantation has the advantage of avoiding the use of wet chemistry operations and diffusion masks and does not require cutting for junction isolation (col. 4, lines 12-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Tyan to use focused ion energy using a secondary ion source as taught by Armini et al. and Ovshinsky because using a

focused ion source to implant atoms allows the dopant particles to be accurately deposited and avoids the use of wet chemistry operations and diffusion masks.

Regarding claims 138, Tyan discloses the use of argon, a noble gas equivalent in function and chemical nature to xenon. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used xenon instead of argon in the method of Tyan because both argon and xenon are noble gases and would be expected to behave similarly.

Regarding claim 141, Armini et al. disclose process controls **20** for "controlling a predetermined level of implant dose and junction depth" (col. 4, lines 37-41).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Tyan to control the ion implantation process as taught by Armini et al. because doing so controls the junction depth and implant dose, which affects the conversion efficiency of the solar cell device.

13. Claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita (U.S. Pat. No. 6,236,061) in view of Armini et al. (U.S. Pat. No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039).

Walpita discloses a method for making a PV cell using ion-assisted e-beam evaporation (col. 6, lines 11-12). The PV cell **60** comprises a substrate **64** having an

electrode film **64** formed thereon, a first semiconductor layer **68** and a second semiconductor layer **70**, and a second electrode film **76** formed on the second semiconductor layer **70** (col. 7, lines 32-55; fig. 4). The semiconductor layers **68, 70** are formed using ion-assisted evaporation wherein "the ion beam energy is in the range 40 to 110 eV and substrate temperature in the range 25°C to 200°C (col. 6, lines 9-18). The semiconductor layer is comprised of a material including Si, SiC, GaAs, InGaAs, GaN and the like (col. 4, lines 50-53).

The method of Walpita differs from the instant invention because Walpita does not disclose the following:

a. Supplying focused ion energy from a secondary source to the semiconductor material, as recited in claims 40, 113 and 124;

b. Supplying energized ions focused at the film surface, as recited in claim 136; and

c. Controlling a quality o a physical interface between the second film and the third film, as recited in claim 141.

Regarding claims 40, 113, 124 and 136, Ovshinsky discloses a method for forming layers of materials, which may be deposited by sputtering or plasma deposition, wherein "one ore more ion beams can be combined with a plasma, sputtering or other type of deposition parameters to insert atoms into the material as it is being deposited" (col. 8, lines 16-30). Ovshinsky further states, "The techniques of the invention can be utilized as a new way of doping photovoltaic materials" (col. 11, line 53 to col. 12, line 2).

Armini et al. teach a method for making solar cells, wherein semiconductors making up the solar cells are doped using an ion implanting step (col. 4, lines 12-24). An ion beam implanter **24** uses an ion source **34** for generating an ion beam **36** which is focused by a lens **40** and directed onto the semiconductor material (col. 4, lines 25-41). This method of ion beam implantation has the advantage of avoiding the use of wet chemistry operations and diffusion masks and does not require cutting for junction isolation (col. 4, lines 12-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Walpita to use focused ion energy using a secondary ion source as taught by Armini et al. and Ovshinsky because using a focused ion source to implant atoms allows the dopant particles to be accurately deposited and avoids the use of wet chemistry operations and diffusion masks.

Regarding claim 141, Armini et al. disclose process controls **20** for "controlling a predetermined level of implant dose and junction depth" (col. 4, lines 37-41).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Walpita to control the ion implantation process as taught by Armini et al. because doing so controls the junction depth and implant dose, which affects the conversion efficiency of the solar cell device.

14. Claims 57, 79, 108, 120 and 132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita (U.S. Pat. No. 6,236,061) in view of Armini et al. (U.S. Pat.

No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039), as applied above to claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141, and further in view of Shiozaki (U.S. Pat. No. 6,222,117).

Walpita, Armini et al. and Ovshinsky disclose a method for fabricating PV devices having the limitations recited in claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141 of the instant invention, as explained above in section 13.

The method disclosed by Walpita, Armini et al. and Ovshinsky differs from the instant invention because Walpita, Armini et al. and Ovshinsky do not disclose forming a high quality region and a highly doped region in the third film.

Shiozaki discloses a method for forming a PV device wherein the semiconductor layers are formed by depositing the semiconductor materials by plasma chemical vapor deposition, which provides energized particles to the forming layers (col. 6, lines 48-55). Shiozaki discloses, "it is preferable that the joined semiconductor layers comprise an n-type or p-type first semiconductor layer, a weak n-type, weak p-type or i-type second semiconductor layer and a conductive p-type or n-type third semiconductor layer which is different from the first semiconductor layer" (col. 5, lines 7-15). The use of a weak n-type or p-type layer and a highly doped outer layer increases the conversion efficiency of the PV device by avoiding carrier recombination and decreasing the resistance at the interface between the highly doped region and the electrode.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the step of forming the semiconductor layers in

the method of Walpita, Armini et al. and Ovshinsky to form the third film having a first high-quality region followed by a second region that is highly doped as taught by Shiozaki because forming a first high-quality region followed by a second highly-doped region increases the conversion efficiency of the PV device. High quality regions increase the conversion efficiency of PV devices because of their lack of defects, and would therefore be desirable throughout the entire semiconductor area.

15. Claims 90-95, 99-101 and 104 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tyan (U.S. Pat. No. 4,207,119) in view of Armini et al. (U.S. Pat. No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039), as applied above to claims 40-45, 47-55, 58, 82, 83, 85-89, 109-116, 121-127 and 133-141, and further in view of Kanai et al. (U.S. Pat. No. 5,468,521).

Tyan, Armini et al. and Ovshinsky teach a method for forming PV devices having the limitations recited in claims 40-45, 47-55, 58, 82, 83, 85-89, 109-116, 121-127 and 133-141 of the instant invention, as explained above in section 12. Tyan discloses forming a semiconductor layer comprised of a material including CdS and CdTe (col. 1, lines 7-9).

The method of Tyan, Armini et al. and Ovshinsky differs from the instant invention because Tyan, Armini et al. and Ovshinsky do not disclose the use of InP, ZnS, $CuInSe_2$, ZnO or CdO to form the semiconductor layers.

Kanai et al. disclose a method for forming PV devices using plasma CVD (col. 1, lines 10-16). The semiconductor film is comprised of a material including Si, SiC, GaAs, InP, ZnS, CdS, CdTe, $CuInSe_2$, ZnO and CdO (col. 30, lines 10-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the materials used in the method of Tyan, Armini et al. and Ovshinsky to use materials such as InP, ZnS, $CuInSe_2$, ZnO and CdO as taught by Kanai et al. because such materials can be equivalently deposited using the same techniques and the use of different materials provides the ability to optimize the PV device according to the desired bandgap of the semiconductor layers. CdZnS and CdZnO are alloys of CdS/ZnS and CdO/ZnO and would be expected to have similar properties to their component compounds and would be expected to function similarly.

16. Claims 90-94, 99 and 100 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita (U.S. Pat. No. 6,236,061) in view of Armini et al. (U.S. Pat. No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039), as applied above to claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141, and further in view of Kanai et al. (U.S. Pat. No. 5,468,521).

Walpita, Armini et al. and Ovshinsky teach a method for forming PV devices having the limitations recited in claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141 of the instant invention, as explained above in section 13. Walpita discloses forming a semiconductor layer comprised of a material including Si, SiC, GaAs, InGaAs, GaN and the like (col. 4, lines 50-53).

The method of Walpita, Armini et al. and Ovshinsky differs from the instant invention because Walpita, Armini et al. and Ovshinsky do not disclose the use of InP, ZnS, $CuInSe_2$, ZnO or CdO to form the semiconductor layers.

Kanai et al. disclose a method for forming PV devices using plasma CVD (col. 1, lines 10-16). The semiconductor film is comprised of a material including Si, SiC, GaAs, InP, ZnS, CdS, CdTe, $CuInSe_2$, ZnO and CdO (col. 30, lines 10-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the materials used in the method of Walpita, Armini et al. and Ovshinsky to use materials such as InP, ZnS, $CuInSe_2$, ZnO and CdO as taught by Kanai et al. because such materials can be equivalently deposited using the same techniques and the use of different materials provides the ability to optimize the PV device according to the desired bandgap of the semiconductor layers. CdZnS and CdZnO are alloys of CdS/ZnS and CdO/ZnO and would be expected to have similar properties to their component compounds and would be expected to function similarly.

17. Claims 96-98 and 100-103 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tyan (U.S. Pat. No. 4,207,119) in view of Armini et al. (U.S. Pat. No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039), as applied above to claims 40-45, 47-55, 58, 82, 83, 85-89, 109-116, 121-127 and 133-141, and further in view of Yamauchi (U.S. Pat. No. 4,365,107).

Tyan, Armini et al. and Ovshinsky teach a method for forming PV devices having the limitations recited in claims 40-45, 47-55, 58, 82, 83, 85-89, 109-116, 121-127 and

133-141 of the instant invention, as explained above in section 12. Tyan discloses forming a semiconductor layer comprised of a material including CdS and CdTe by means of ion plating or sputtering (col. 1, lines 7-9; col. 3, lines 35-40).

The method of Tyan, Armini et al. and Ovshinsky differs from the instant invention because Tyan, Armini et al. and Ovshinsky do not disclose the use of GaN, InGaN, AlGaN, InP, GaAs, InGaAs or InGaP to form the semiconductor layers.

Yamauchi discloses a method for fabricating PV devices wherein the semiconductor layers are formed using ion plating or sputtering (col. 2, lines 27-29). This process is used to fabricate semiconductor layers comprised of materials including AlN, GaN, GaP, GaAs, InN, InP, InAs or alloys thereof such as GaInP (col. 2, lines 19-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the materials used in the method of Tyan, Armini et al. and Ovshinsky to use materials such as GaN, InGaN, AlGaN, InP, GaAs, InGaAs and InGaP as taught by Yamauchi because such materials can be equivalently deposited using the same techniques and the use of different materials provides the ability to optimize the PV device according to the desired bandgap of the semiconductor layers. InGaN, AlGaN and InGaAs are alloys of InN/GaN, AlN/GaN and InAs/GaAs, respectively, and would be have properties similar to their individual constituents.

18. Claims 97, 98 and 103 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita (U.S. Pat. No. 6,236,061) in view of Armini et al. (U.S. Pat.

No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039), as applied above to claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141, and further in view of Yamauchi (U.S. Pat. No. 4,365,107).

Walpita, Armini et al. and Ovshinsky teach a method for forming PV devices having the limitations recited in claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141 of the instant invention, as explained above in section 13. Walpita discloses forming a semiconductor layer comprised of a material including Si, SiC, GaAs, InGaAs, GaN and the like (col. 4, lines 50-53).

The method of Walpita, Armini et al. and Ovshinsky differs from the instant invention because Walpita, Armini et al. and Ovshinsky do not disclose the use of InGaN, InP or InGaP to form the semiconductor layers.

Yamauchi discloses a method for fabricating PV devices wherein the semiconductor layers are formed using ion plating or sputtering (col. 2, lines 27-29). This process is used to fabricate semiconductor layers comprised of materials including AlN, GaN, GaP, GaAs, InN, InP, InAs or alloys thereof such as GaInP (col. 2, lines 19-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the materials used in the method of Walpita, Armini et al. and Ovshinsky to use materials such as InGaN, InP and InGaP as taught by Yamauchi because such materials can be equivalently deposited using the same techniques and the use of different materials provides the ability to optimize the PV device according to the desired bandgap of the semiconductor layers. InGaN, AlGaN

and InGaAs are alloys of InN/GaN, AlN/GaN and InAs/GaAs, respectively, and would be have properties similar to their individual constituents.

19. Claims 105-107, 117-119 and 128-131 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita (U.S. Pat. No. 6,236,061) in view of Armini et al. (U.S. Pat. No. 4,353,160) and Ovshinsky (U.S. Pat. No. 4,520,039), as applied above to claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141, and further in view of Matsuda et al. (U.S. Pat. No. 5,571,749).

Walpita, Armini et al. and Ovshinsky teach a method for forming PV devices having the limitations recited in claims 40-46, 51, 53, 56, 80-89, 95, 96, 101, 102, 104, 113-115, 124-126, 136 and 141 of the instant invention, as explained above in section 13. Walpita further discloses forming the PV devices on polymer or metal film substrates (col. 3, lines 25-53).

The method of Walpita, Armini et al. and Ovshinsky differs from the instant invention because Walpita, Armini et al. and Ovshinsky do not disclose supplying the substrate on a roll or passing the substrate over a curved thermally controlled object.

Matsuda et al. disclose a method for forming a semiconductor film on a metal or polymer film using a plasma CVD process (col. 5, lines 37-54). The temperature of the substrate is controlled by passing the substrate over rollers having cold water flowing through them (col. 4, lines 31-33; col. 24, lines 47-50; fig. 12A-C). The substrate can be wound into a roll form (col. 5, line 66 to col. 6, line 2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the substrate used in the method of Walpita, Armini et al. and Ovshinsky to use a substrate supplied in a roll form as taught by Matsuda et al. because providing the substrate on a roll allows the PV device to be manufactured in a continuous fashion.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Walpita, Armini et al. and Ovshinsky to incorporate cooling rollers as taught by Matsuda et al. because by using the cooling rollers, "the temperature to be controlled by the means for heating and cooling the substrate is changed in accordance with the movement of the substrate" (col. 6, lines 29-34).

Response to Arguments

20. Applicant's arguments with respect to claims 40-58 and 78-135 have been considered but are moot in view of the new ground(s) of rejection.

21. In response to the rejections made under 35 U.S.C. 103, Applicant has argued, "Walpita does not disclose forming a high quality region" (see page 39 of Applicant's response). It is noted that the phrase "high quality region" is a relative term and does not appear to distinguish the method disclosed by Walpita in view of Armini et al. and Ovshinsky, as explained above. One skilled in the art that the formation of high quality regions, and high quality solar cells in general, is an obvious goal to strive for because such high quality devices are dependable and efficient.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703) 305-0180. The examiner can normally be reached on Monday-Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Nam Nguyen

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
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blm
April 21, 2003